

## ORIGINAL ARTICLE

# Two new *Coelotes* species from China (Araneae: Agelenidae: Coelotinae)

Ying Luo, Jian Chen\*

Hubei Collaborative Innovation Center for Green Transformation of Bio-Resources, Centre for Behavioral Ecology and Evolution, College of Life Sciences, Hubei University, Wuhan 430062, China

\*Corresponding author; E-mail: chen.jian\_hb@foxmail.com

**Abstract** Two new *Coelotes* spider species are reported from the Tiantangzhai National Forest Park at the juncture of Hubei and Anhui Provinces in China: *Coelotes obtusangulus* sp. nov. and *C. tiantangensis* sp. nov. Detailed descriptions and illustrations of these species are presented in this paper.

**Keywords** Taxonomy, spider, *Coelotes*, new species.

## 1 Introduction

Tiantangzhai National Forest Park (Fig 29), with the second highest peak in the Dabie Mountains, is located at the juncture of Hubei and Anhui Provinces in China, and forms part of the watershed of the Yangtze River and the Huai River. Tiantangzhai has a subtropical climate, with typically mild climate accompanied by 1350 mm rainfall every year. The fauna is typical for the transition zone between the Palaearctic and Oriental Regions: e.g., Palearctic Otididae, such as *Otis tarda*; Oriental Suidae and Viverridae, such as *Sus scrofa* and *Viverricula indica*, are all found in this region. Nearly 1400 species of plants and 600 species of animals exist here, including the Chinese giant salamander *Andrias davidianus* and the leopard *Panthera pardus*. Tiantangzhai is the last piece of virgin habitat remaining in eastern China (Xie & Chen, 2011).

Coelotine spiders are endemic to the Holarctic Region, where they are distributed from the eastern of North America, Europe, Middle Asia to East Asia (Wang, 2014). *Coelotes* Blackwall, 1840 is one of the most diverse Coelotine genera (Wang, 2002; Wang, 2014; World Spider Catalog, 2014). At present, a total of 187 *Coelotes* species are known worldwide, among which 48 are recorded from China (World Spider Catalog, 2014). By recent field surveys in Tiantangzhai National Forest Park, China have yielded two new species belonging to the genus *Coelotes*, which are described in the current paper.

## 2 Materials and methods

All specimens used in this study are deposited in the Centre for Behavioral Ecology and Evolution (CBEE), College of Life Sciences, Hubei University. Specimens were examined with an Olympus SZX16 stereomicroscope and further details were studied with an Olympus BX51 compound microscope. The male palps and female epigynes were examined and illustrated after dissecting them from the spider bodies.

All measurements obtained using an Olympus SZX16 stereomicroscope, are given in millimeters (mm). Eye diameters were taken at their widest point. The total body length does not include the length of the chelicerae or spinnerets.

The leg measurements are shown as total length (femur, patella + tibia, metatarsus, tarsus). The terminology used in the text and in the figure legends mainly follows Wang (2002) and Liu and Li (2010).

Abbreviations used in the text and figures are:

ALE—anterior lateral eye;

AME—anterior median eye;

AME–ALE—distance between AME and ALE;

AME–AME—distance between AMEs;

ALE–PLE—distance between ALE and PLE;

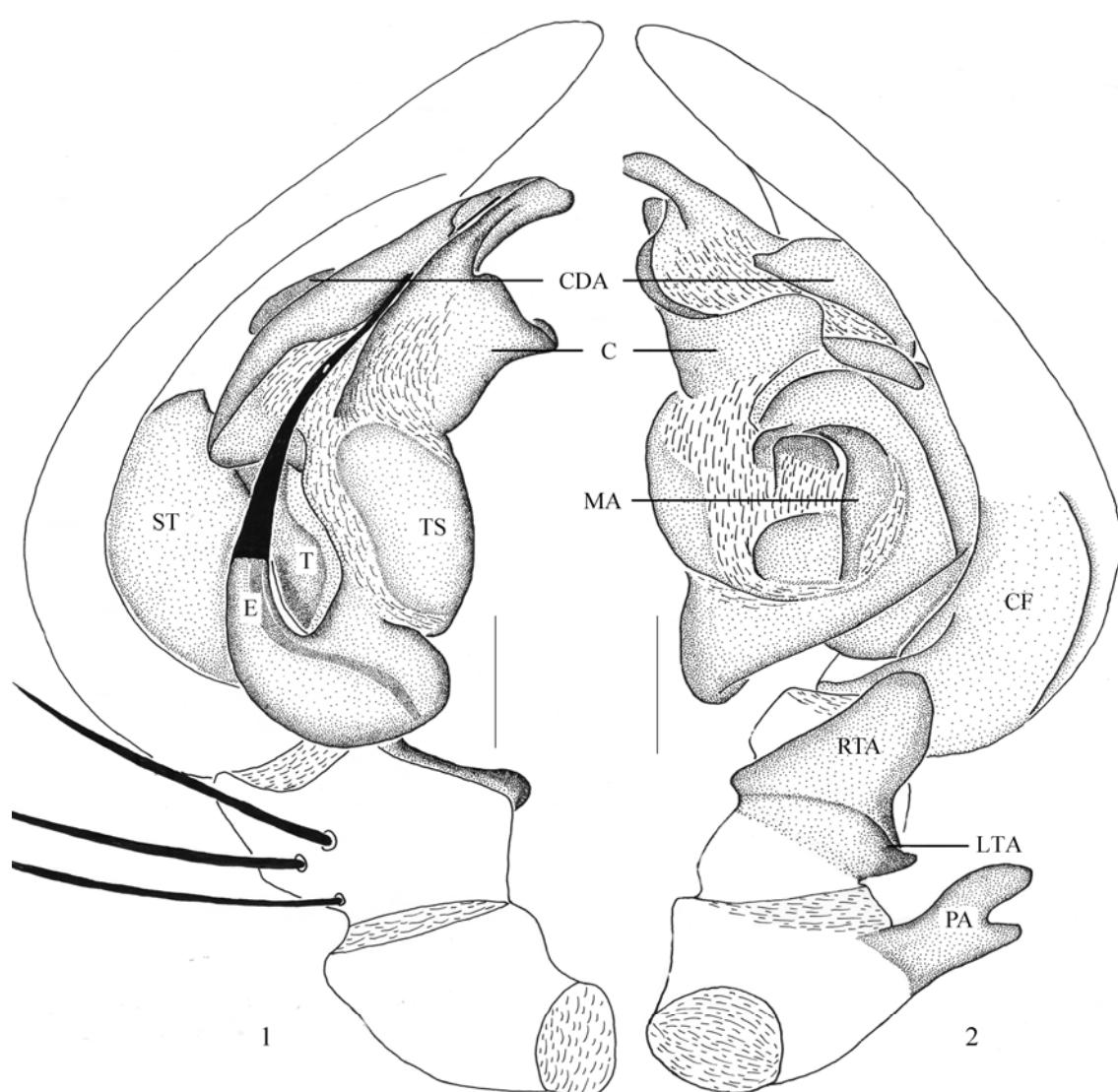
PLE—posterior lateral eye;

PME—posterior median eye;

PME–PLE—distance between PME and PLE;

PME–PME—distance between PMEs.

I, II, III, IV—legs I to IV.



Figs 1–2. *Coelotes obtusangulus* sp. nov., male, holotype. 1. Left male palp, prolateral view. 2. Ditto, retrolateral view. Scale bars = 0.2 mm. Abbreviations: C—conductor; CDA—conductor dorsal apophysis; CF—cymbial furrow; E—embolus; LTA—lateral tibial apophysis; MA—median apophysis; PA—patellar apophysis; RTA—retrolateral tibial apophysis; ST—subtegulum; T—tegulum; TS—tegular sclerite.

### 3 Taxonomy

**Agelenidae C.L. Koch, 1837**

**Coelotinae F.O. Pickard-Cambridge, 1893**

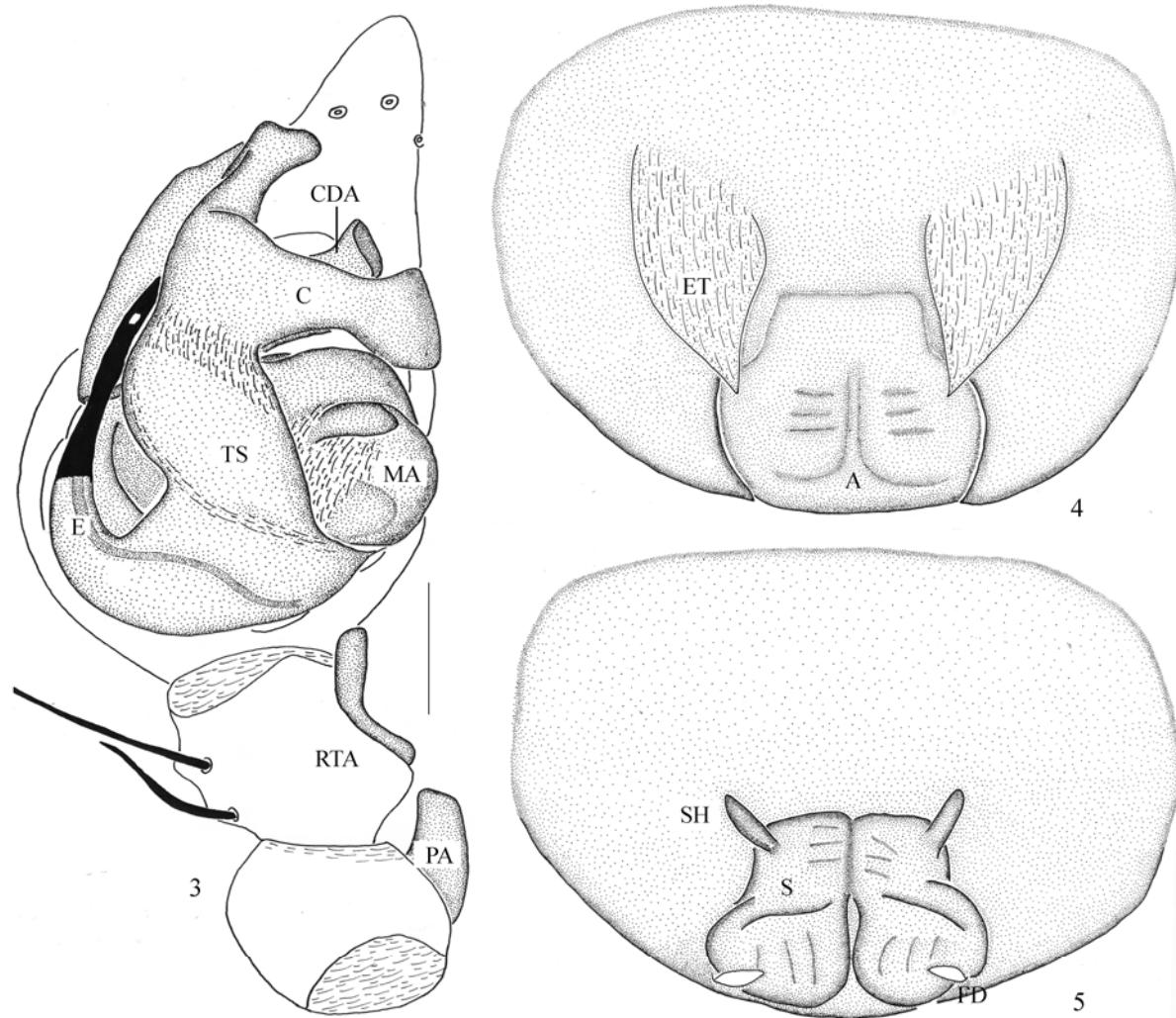
***Coelotes* Blackwall, 1840**

***Coelotes obtusangulus* sp. nov.** (Figs 1–14, 29)

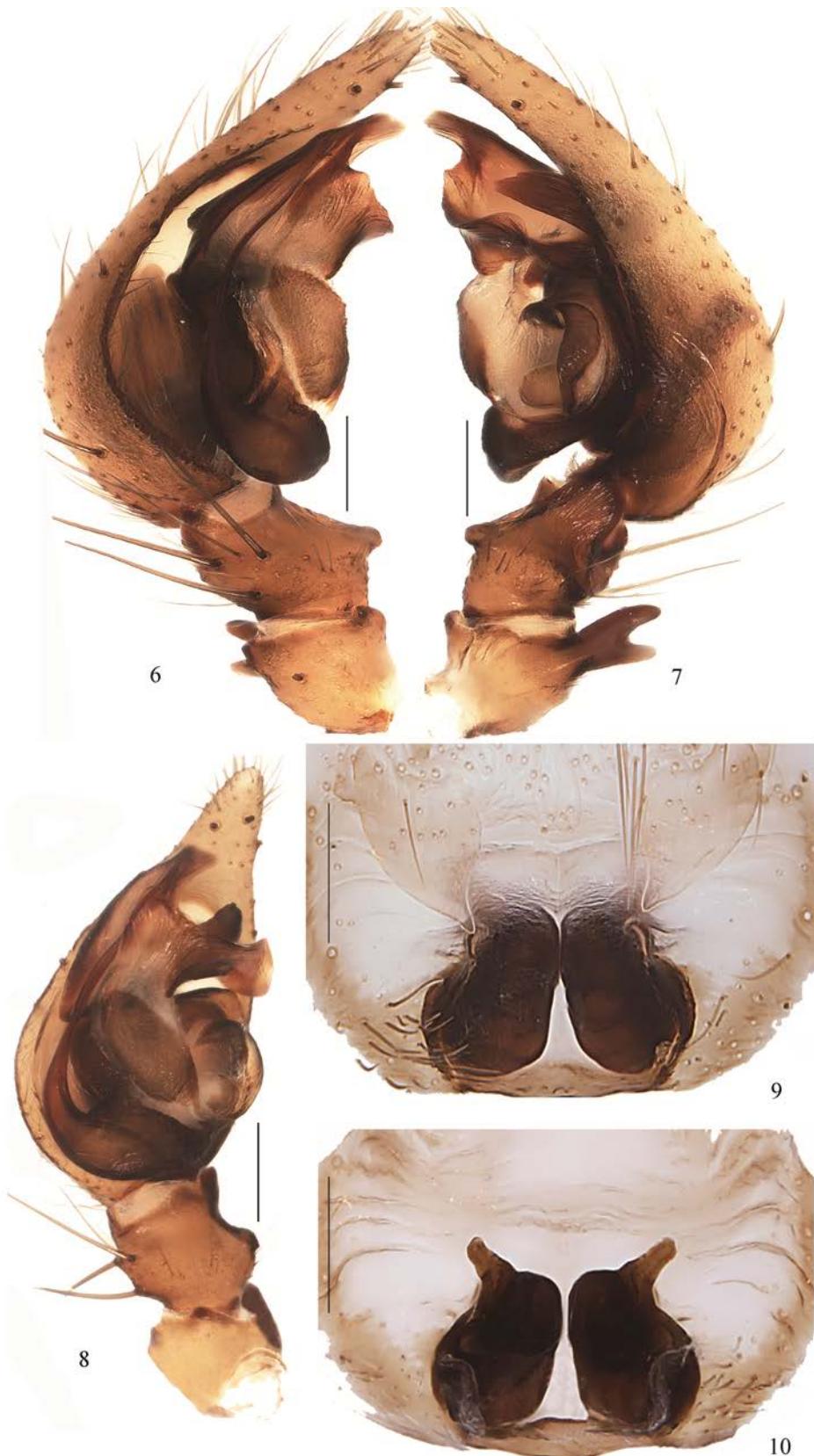
Material examined. Holotype ♂, Tiantangzhai National Forest Park, Anhui Province, China, 28–29 September 2009, leg. Hai-Juan Xie and Xin Xu. Paratype 1♀, same data as holotype. All specimens are deposited in CBEE.

Etymology. The specific name is taken from the Latin adjective *obtusangulus*, meaning blunt, referring to the blunt end of male retrolateral tibial apophysis.

Diagnosis. This new species is similar to *Coelotes tiantangensis* sp. nov. in having a bifurcated patellar apophysis, the



Figs 3–5. *Coelotes obtusangulus* sp. nov. 3. Left male palp, ventral view, holotype. 4. Epigynum, ventral view, female, paratype. 5. Vulva, dorsal view, female, paratype. Scale bars=0.2 mm. Abbreviations: A—atrium; C—conductor; CDA—conductor dorsal apophysis; E—embolus; ET—epigynal teeth; MA—median apophysis; PA—patellar apophysis; RTA—retrolateral tibial apophysis; S—spermathecae; SH—spermathecal head; TS—tegular sclerite.



Figs 6–10. *Coelotes obtusangulus* sp. nov. 6. Left male palp, prolatera view. 7. Ditto, retrolateral view. 8. Left male palp, ventral view, holotype. 9. Epigynum, ventral view, female, paratype. 10. Vulva, dorsal view, female, paratype. Scale bars = 0.2 mm.



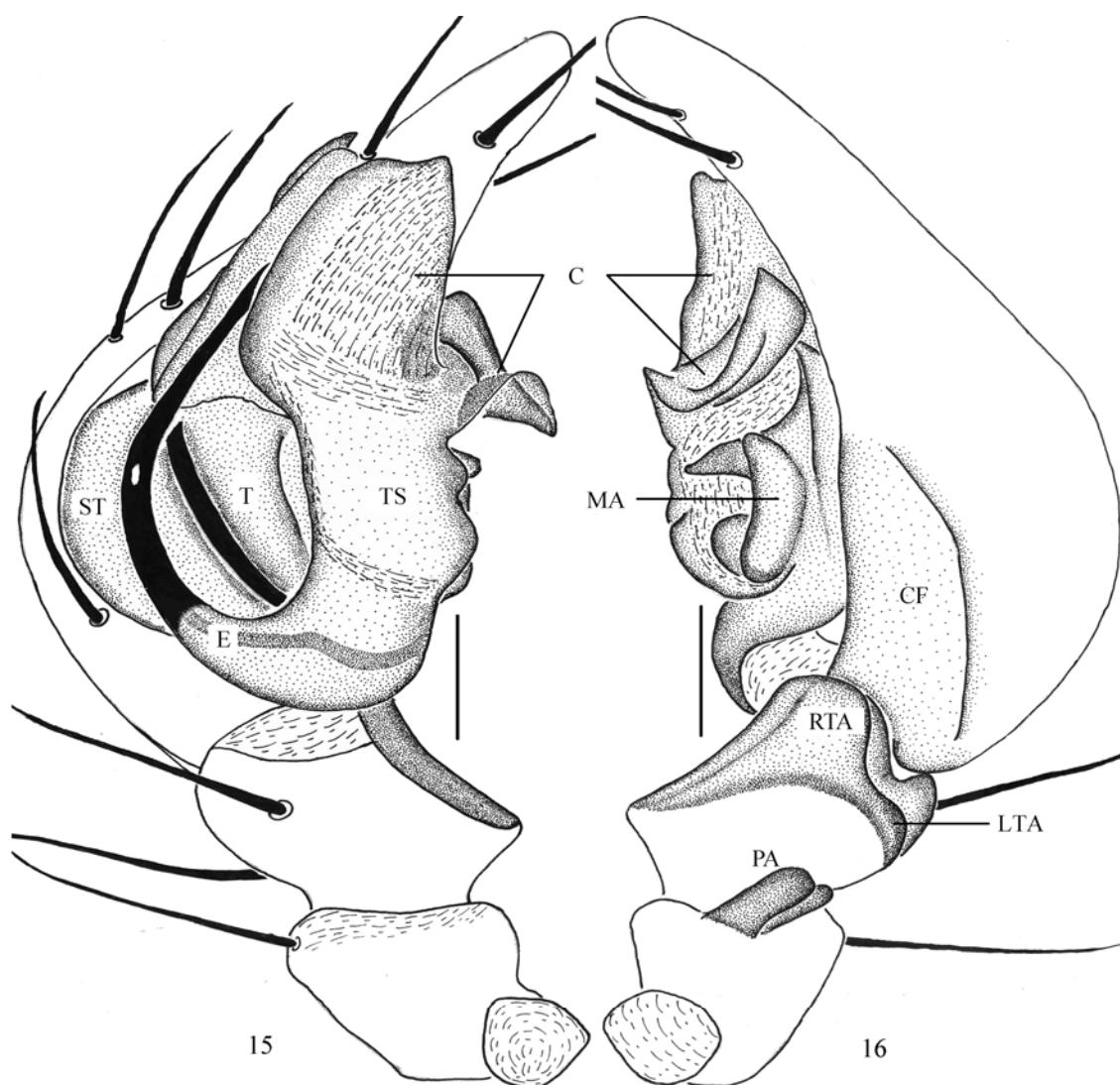
Figs 11–14. *Coelotes obtusangulus* sp. nov. 11. Male habitus, dorsal view, holotype. 12. Ditto, ventral view. 13. Female habitus, dorsal view, paratype. 14. Ditto, ventral view. Scale bars = 1 mm.

short cymbial furrow, the large, round median apophysis, the significantly curved conductor, the absence of dorsal aphophysis in males, the broad epigynal teeth with sharp tips, the short copulatory conducts, the ellipse-shaped spermathecae, the slender spermathecal heads situated anteriorly laterad of spermathecae in females, but can be distinguished from the latter by the following characters: 1). the patellar apophysis longer than patellar in *C. obtusangulus* sp. nov., but shorter in *C. tiantangensis* sp. nov. (Figs 2, 16); 2). RTA with distal end extending beyond tibia in *C. obtusangulus* sp. nov., but not in *C. tiantangensis* sp. nov. (Figs 2, 16); 3). the prolateral part of conductor narrow, less than half of tegular sclerite width in *C. obtusangulus* sp. nov., but slightly wider than tegular sclerite width in *C. tiantangensis* sp. nov. (Figs 1, 15); 4). the epigynal teeth separate in *C. obtusangulus* sp. nov., but closed with each other in *C. tiantangensis* sp. nov. (Figs 4, 18); 5). the copulatory ducts totally hidden by the spermathecae in *C. obtusangulus* sp. nov., but not in *C. tiantangensis* sp. nov. (Figs 5, 19). These two new species can be distinguished from other Coelotinae by the bifurcated patellar apophysis with ventral branch strongly larger than dorsal (*Coelotes mastrucatus* (Wang et al., 1990) also having bifurcated patellar apophysis, but its ventral branch is much smaller than the dorsal) in the males (Figs 1–3, 6–8, 15–17, 20–22), by the combinations of the broad epigynal teeth with sharp tips, the short copulatory conducts, the ellipse-shaped spermathecae in the females (Figs 4–5, 9–10, 18–19, 23–24).

**Description.** Male (holotype). Total length 5.17. Prosoma 2.58 long, 1.80 wide; opisthosoma 2.38 long, 1.49 wide. Eye AME 0.06, ALE 0.12, PME 0.12, PLE 0.11, AME–AME 0.04, AME–ALE 0.04, ALE–PLE 0.03, PME–PME 0.07, PME–PLE 0.09. Leg formula, IV, I, II, III; leg, I 7.51 (2.11, 2.57, 1.75, 1.08); II 6.57 (1.89, 2.18, 1.56, 0.94); III 6.33 (1.88,

1.97, 1.71, 0.77); IV 9.04 (2.43, 2.89, 2.58, 1.14). Chelicerae with 3 promarginal and 2 retromarginal teeth. Patellar apophysis long, bifurcated; retolateral tibial apophysis large and broad, with a blunt distal end extending beyond tibia; lateral tibial apophysis small, slightly separated from retolateral tibial apophysis; cymbial furrow no more than half the length of the cymbium; conductor broad and complex, significantly curved, almost "L" shaped; conductor dorsal apophysis broad, with sharp end and leaf-like in the retrolateral view; median apophysis broad, round; embolus filiform, originating prolaterally (Figs 1–3, 6–8, 11–12).

Female (paratype). Total length 5.39. Prosoma 2.71 long, 2.00 wide; opisthosoma 2.68 long, 1.70 wide. Eye AME 0.088, ALE 0.13, PME 0.14, PLE 0.13, AME–AME 0.04, AME–ALE 0.06, ALE–PLE 0.04, PME–PME 0.08, PME–PLE 0.11. Leg formula IV, I, II, III; leg I 7.80 (2.15, 2.65, 1.75, 1.25); II 6.70 (1.90, 2.30, 1.45, 1.05); III 5.35 (1.75, 2.10, 1.70, 1.05); IV 9.45 (2.35, 3.00, 2.55, 1.55). Chelicerae with 3 promarginal and 2 retromarginal teeth. Epigynal teeth lamella large and broad, slightly longer than wide, situated medially and laterally, widely separated; atrium small, situated posteriorly; copulatory ducts small, totally hidden by the spermathecae; spermathecae ellipse-shaped, close to each other; spermathecal heads short, originating from dosal side of spermathecal, situated anteriorly laterad of spermathecae (Figs 4–5, 9–10, 13–14).



Figs 15–16. *Coelotes tiantangensis* sp. nov., male, holotype. 15. Left male palp, prolateral view. 16. Ditto, retrolateral view. Scale bars = 0.2 mm. Abbreviations: C—conductor; CDA—conductor dorsal apophysis; CF—cymbial furrow; E—embolus; LTA—lateral tibial apophysis; MA—median apophysis; PA—patellar apophysis; RTA—retrolateral tibial apophysis; ST—subtegulum; T—tegulum; TS—tegular sclerite.

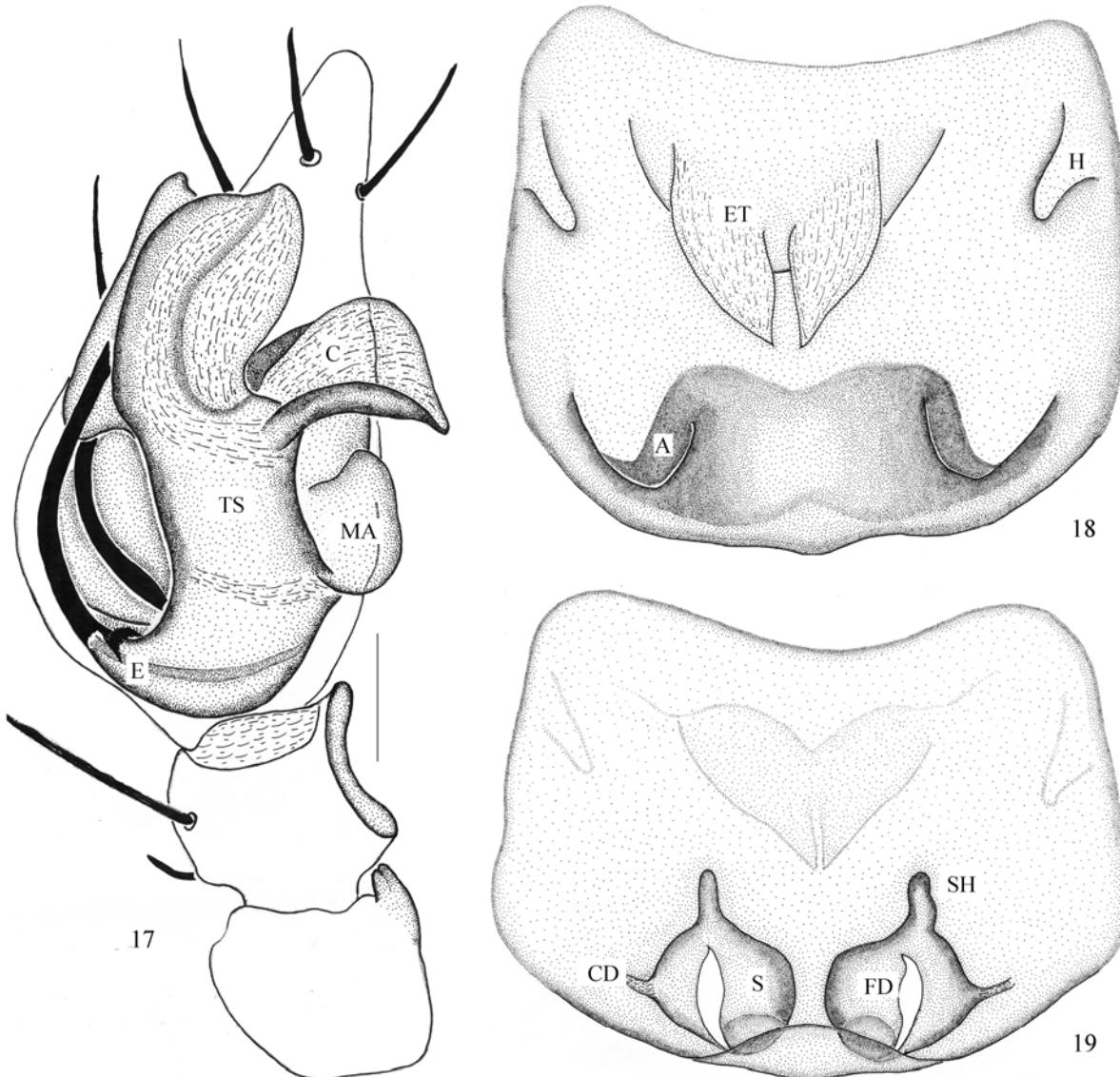
Distribution. China (Anhui) (Fig 29).

*Coelotes tiantangensis* sp. nov. (Figs 15–29)

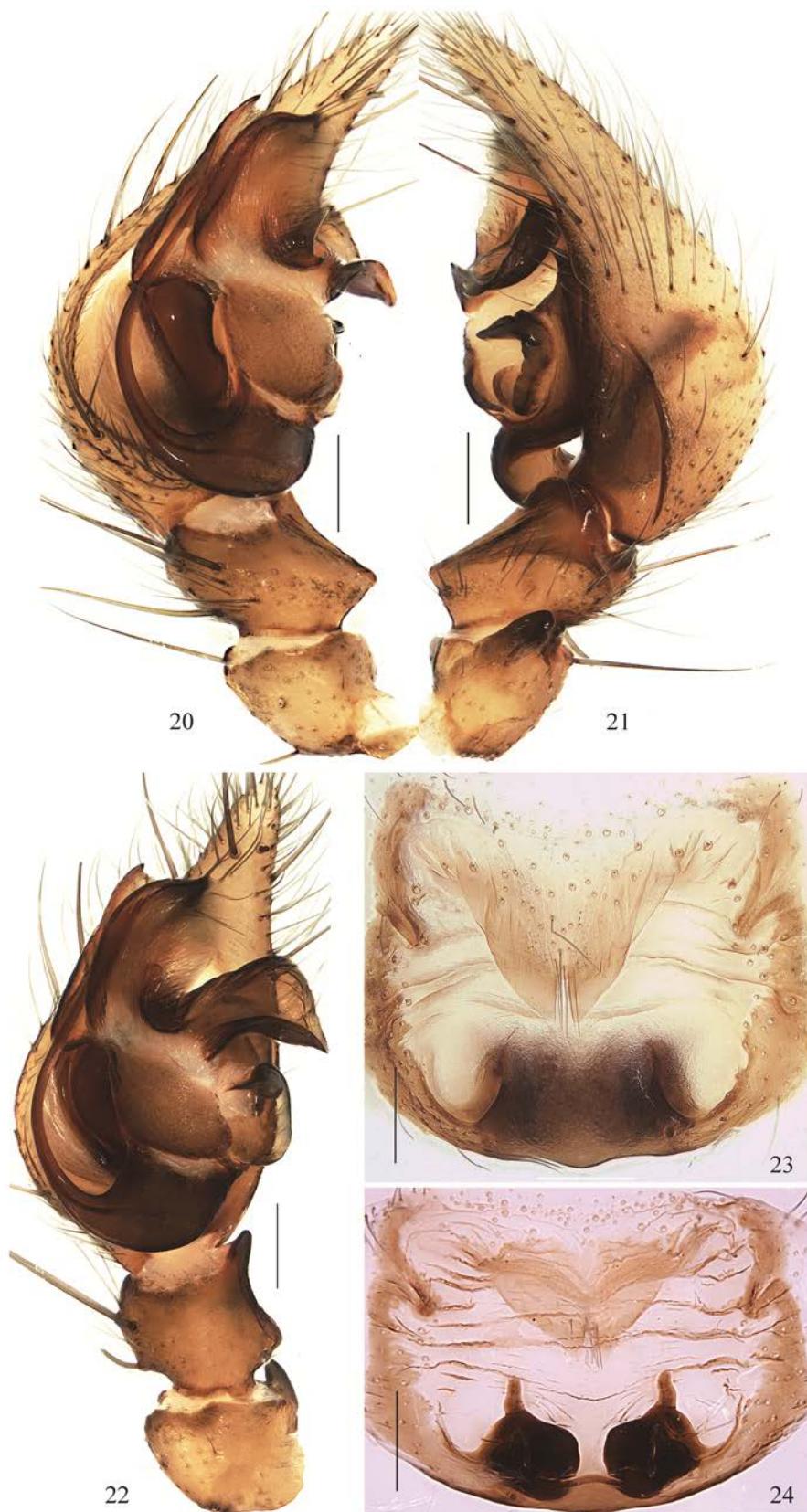
Material examined. Holotype ♂, Tiantangzhai National Forest Park, Hubei Province, China, 27 September 2012, leg. Ying Luo and Jie Liu. Paratypes: 8♀, same data as holotype; 4♂, Tiantangzhai National Forest Park, Anhui Province, 28 September 2009, leg. Hai-Juan Xie and Xin Xu. All specimens are deposited in CBEE.

Etymology. The specific name is an adjective, referring to the type locality, Tiantangzhai, in which “Tiantang” means paradise, and “zhai” means stockaded village.

Diagnosis. This new species is similar to *C. obtusangulus* sp. nov., but can be distinguished from the latter by the shorter patellar apophysis, the RTA with distal end not extending beyond tibia, the large epigynal teeth closed with each other (Figs 2, 4, 16, 18). More details can be seen under the above diagnosis of *C. obtusangulus* sp. nov.



Figs 17–19. *Coelotes tiantangensis* sp. nov. 17. Left male palp, ventral view, holotype. 18. Epigynum, ventral view, female, paratype. 19. Vulva, dorsal, female, paratype. Scale bars = 0.2 mm. Abbreviations: A—atrium; C—conductor; CD—copulatory duct; E—embolus; ET—epigynal teeth; FD—fertilization duct; H—hood; MA—median apophysis; S—spermathecae; SH—spermathecal head; TS—tegular sclerite.



Figs 20–24. *Coelotes tiantangensis* sp. nov. 20. Left male palp, prolateral. 21. Ditto, retrolateral. 22. Left male palp, ventral view, holotype. 23. Epigynum, ventral view, female, paratype. 24. Vulva, dorsal view, female, paratype. Scale bars=0.2 mm.



Figs 25–28. *Coelotes tiantangensis* sp. nov. 25. Male, dorsal view, holotype. 26. Ditto, ventral view. 27. Female, dorsal view, paratype. 28. Ditto, ventral view. Scale bars = 1 mm.

**Description. Male (holotype).** Total length 5.21. Prosoma 2.53 long, 1.94 wide; opisthosoma 2.68 long, 1.73 wide. Eye AME 0.08, ALE 0.13, PME 0.13, PLE 0.13, AME–AME 0.05, AME–ALE 0.05, ALE–PLE 0.04, PME–PME 0.08, PME–PLE 0.10. Leg formula IV, I, II, III; leg I 7.50 (2.15, 2.55, 1.55, 1.25); II 6.40 (1.70, 2.15, 1.50, 1.05); III 6.20 (1.75, 1.85, 1.60, 1.00); IV 8.70 (2.30, 2.75, 2.40, 1.25). Chelicerae with 3 promarginal and 2 retromarginal teeth. Patellar apophysis short, bifurcated; retolateral tibial apophysis large and broad, with end not extending beyond tibia; lateral tibial apophysis slightly broad, closed to retolateral tibial apophysis; cymbial furrow short, no more than half the length of the cymbium; conductor broad and complex, significantly curved, almost "V" shaped; conductor dorsal apophysis absent; median apophysis large and round; embolus filiform, originating prolaterally (Figs 15, 17, 22, 25, 26).

**Female (paratype).** Total length 4.96. Prosoma 2.58 long, 1.75 wide; opisthosoma 2.38 long, 1.65 wide. Eye AME 0.08, ALE 0.14, PME 0.13, PLE 0.14, AME–AME 0.04, AME–ALE 0.05, ALE–PLE 0.03, PME–PME 0.08, PME–PLE 0.11. Leg formula IV, I, II, III; leg I 6.30 (1.60, 2.35, 1.35, 1.00); II 5.65 (1.60, 1.95, 1.15, 0.95); III 5.38 (1.50, 1.65, 1.35, 0.88); IV 7.47 (1.94, 2.47, 2.01, 1.05). Chelicerae with 3 promarginal and 2 retromarginal teeth. Epigynal teeth lamella large, broad, slightly longer than wide, situated anteriorly and medially, closed to each other basically; the epigynal hoods present, situated anteriorly and laterally; atrium large, with a broad septum, atrium extending into epigynum, forming 2 round copulatory duct openings; copulatory duct short; spermathecae oval, slightly separated; spermathecal heads short, situated anteriorly laterad of spermathecae (Figs 18–19, 23–24, 27–28).

**Distribution.** China (Anhui, Hubei) (Fig 29).

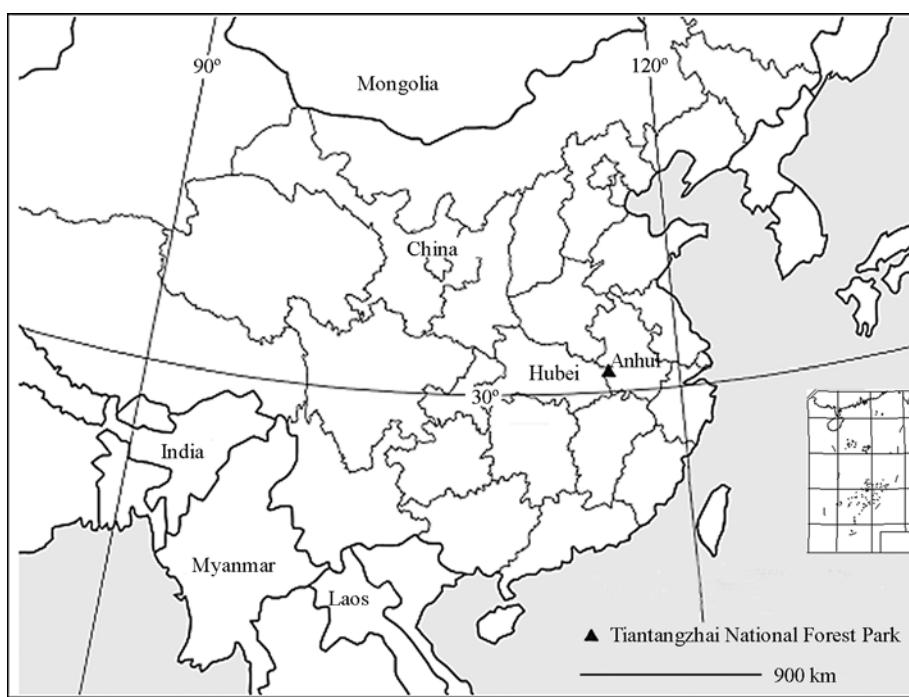


Fig. 29. Location map of the Tiantangzhai National Forest Park.

**Funding** This study was financially supported by the National Natural Sciences Foundation of China (31172113, 31272268) and the Special Foundation of the Ministry of Science and Technology of the People's Republic of China (2014FY110100).

**Acknowledgements** We thank Hai-Juan Xie and Xin Xu (CBEE) for providing specimens. The manuscript benefited from comments by Jie Liu (CBEE) and Jeremy Miller (Department of Terrestrial Zoology, Naturalis Biodiversity Center, Netherlands). We are grateful to the anonymous reviewers for their comments on the manuscript.

## References

Li, S-Q and Wang, X-P 2014. Endemic spiders in China. Available from: <http://www.ChineseSpecies.com> (accessed 9 November 2014).

Liu, J and Li, S-Q 2010. New Coelotine spiders from Xishuangbanna Rainforest, Southwestern China (Araneae: Amaurobiidae). *Zootaxa*, 2442: 1–24.

Wang, X-P 2002. A generic-level revision of the spider subfamily Coelotinae (Araneae, Amaurobiidae). *Bulletin of the American Museum of Natural History*, 269: 1–150.

Wang, X-P 2003. Species revision of the coelotine spider genera *Bifidocoelotes*, *Coronilla*, *Draconarius*, *Femoracoelotes*, *Leptocoelotes*, *Longicoelotes*, *Platocoelotes*, *Spiricoelotes*, *Tegeocoelotes*, and *Tonsilla* (Araneae: Amaurobiidae). *Proceedings of the California Academy of Sciences*, 54: 499–662.

Wang, X-P 2014. Online Coelotinae, version 2.0. Available from: <http://www.amaurobiidae.com> (accessed 9 November 2014).

Wang, X-P, Zhu, M-S and Li, S-Q 2010. A review of the coelotine genus *Eurocoelotes* (Araneae: Amaurobiidae). *The Journal of Arachnology*, 38: 79–98.

World Spider Catalog. 2014. World Spider Catalog. Natural History Museum Bern. Available from: <http://wsc.nmbe.ch> (version 15.5). (accessed 9 November 2014).

Xie, H-J and Chen, J 2011. Two new *Draconarius* species and the first description of the male *Draconarius molluscus* from Tiantangzhai National Forest Park, China (Araneae: Agelenidae: Coelotinae). *The Journal of Arachnology*, 39: 30–40.